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Selection of Pipe
for
Modern Buildings

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The Selection of Pipe for Modern Buildings

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A·M·BYERS COMPANY
ESTABLISHED 1854
PITTSBURGH, P.A.

New York

Boston

Chicago

Los Angeles

Houston



The total cost of Byers Pipe for the types of homes shown here is only ten or twenty dollars more than the cost of the poorest pipe made.

IN the Y. M. C. A. Railroad Branch, St. Louis, built in 1907, the piping after seven years' service gave constant trouble and was found to be so badly rusted out throughout, that the entire heating and plumbing system (excepting only the cold water lines) had to be torn out and replaced with Byers Genuine Wrought Iron Pipe, at a cost of thousands of dollars.

Genuine wrought iron pipe was used in the Hamburg American Building, New York City, 30 years ago, and has never caused any trouble. Other pipe used on extensions made seven years ago, in the same building, began to develop leaks in two years, and has given trouble ever since.

The Tacoma Building, Chicago's first steel skyscraper, was erected in 1888 and genuine wrought iron pipe used throughout in the heating system. After 27 years' service, the great mass of pipe in this building is still in satisfactory condition, while small quantities of other pipe used for repairs during the past ten years, have never lasted over five years—much of it only one or two years.

Experience ever following experience thus shows that the importance to the engineer, architect, builder and owner of selecting the right kind of pipe, cannot be exaggerated, and the purpose of this little book is to show something about the processes and raw materials involved



**Tacoma Building,
Chicago, 27 Years Old.**
Byers Pipe, used
throughout the heat-
ing system of this
building, is still in
use and in good con-
dition. Cheaper pipe,
used for a few replace-
ments in recent years,
has lasted only from
one to five years.



**The Dakota Apartments, 8th Avenue and 71st Street,
New York City, 34 Years Old.** Original Byers piping
in heating system still in excellent condition.

in the making of iron and steel pipe, together with other facts which may serve as a guide in the selection of pipe for water, gas, steam and air lines in buildings of every kind, including private residences.

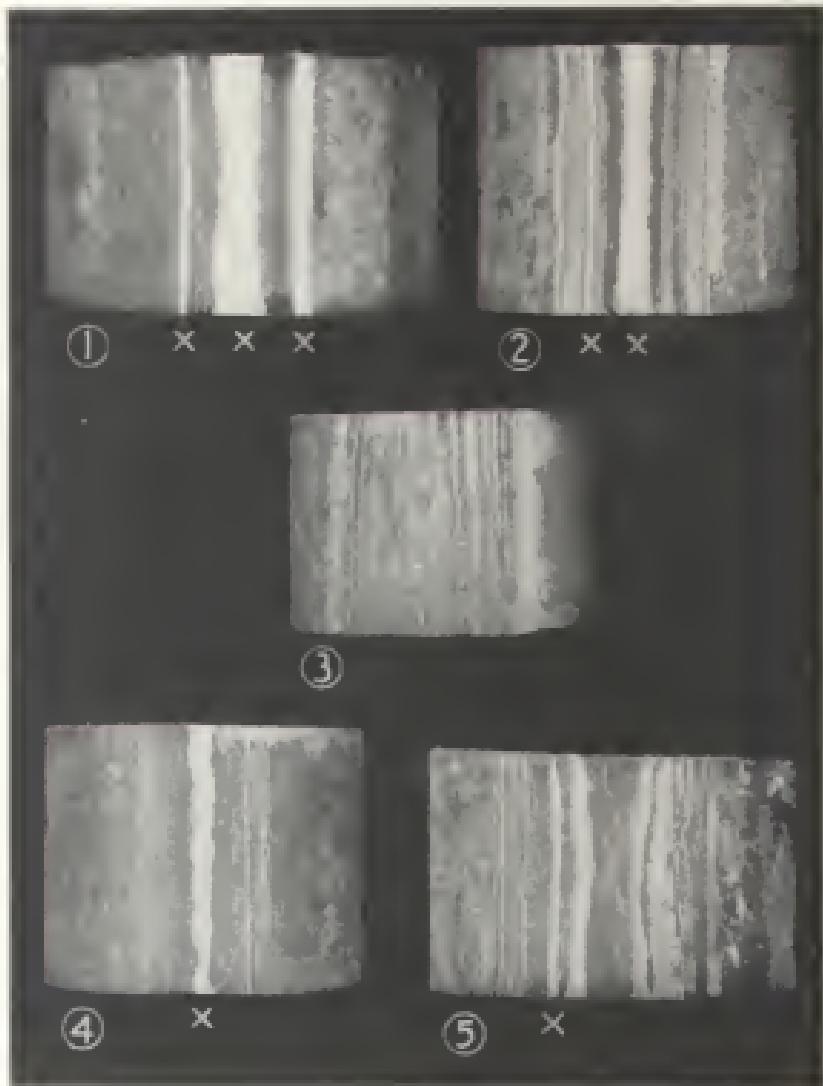
A little Pipe History

There are three kinds of welded pipe on the market, as follows:

1. Genuine Wrought Iron Pipe.
2. Pipe SOLD as Genuine Wrought Iron, but actually containing a greater or smaller amount of steel scrap.
3. Steel Pipe.

Steel pipe was introduced in 1887, but very little of it was sold until after 1890. Almost simultaneously, pipe made from wrought iron mixed with steel scrap came on the market. That a great amount of this kind of pipe is still sold, will be understood from a glance at the illustration on page 6, showing etched samples of five different kinds of pipe purchased in the open market as genuine wrought iron. Only sample No. 3 is genuine wrought iron; the other four samples all contain steel scrap. The bright strata indicated by a white cross are steel. Such pipe sells at slightly lower prices than genuine wrought iron, but its resistance to corrosion and its physical soundness are very uncertain factors, as will be explained later.

It is sufficient for our purposes here to note that pipe of this kind is being constantly used in comparison with steel pipe to show the superiority of the latter, to the prejudice of *genuine* wrought iron pipe, free from scrap.



Sample rings cut from different makes of pipe purchased in the open market as "wrought iron." Only one, No. 3, which is Byers, was found entirely free from steel scrap. The steel streaks are indicated by X. Purchasers can always identify Byers Pipe by the Name and Year rolled in the pipe—see page 11.

Differences Between Iron and Steel Pipe

Genuine wrought iron is refined from pig iron, by the hand puddling process. It takes nearly two hours, and the attention of an expert puddler and his helper, to refine a small charge of 560 lbs. of pig iron.

Steel for pipe manufacture is also refined from pig iron, usually in the Bessemer Converter, producing from 10 to 15 tons of metal in less than 20 minutes.

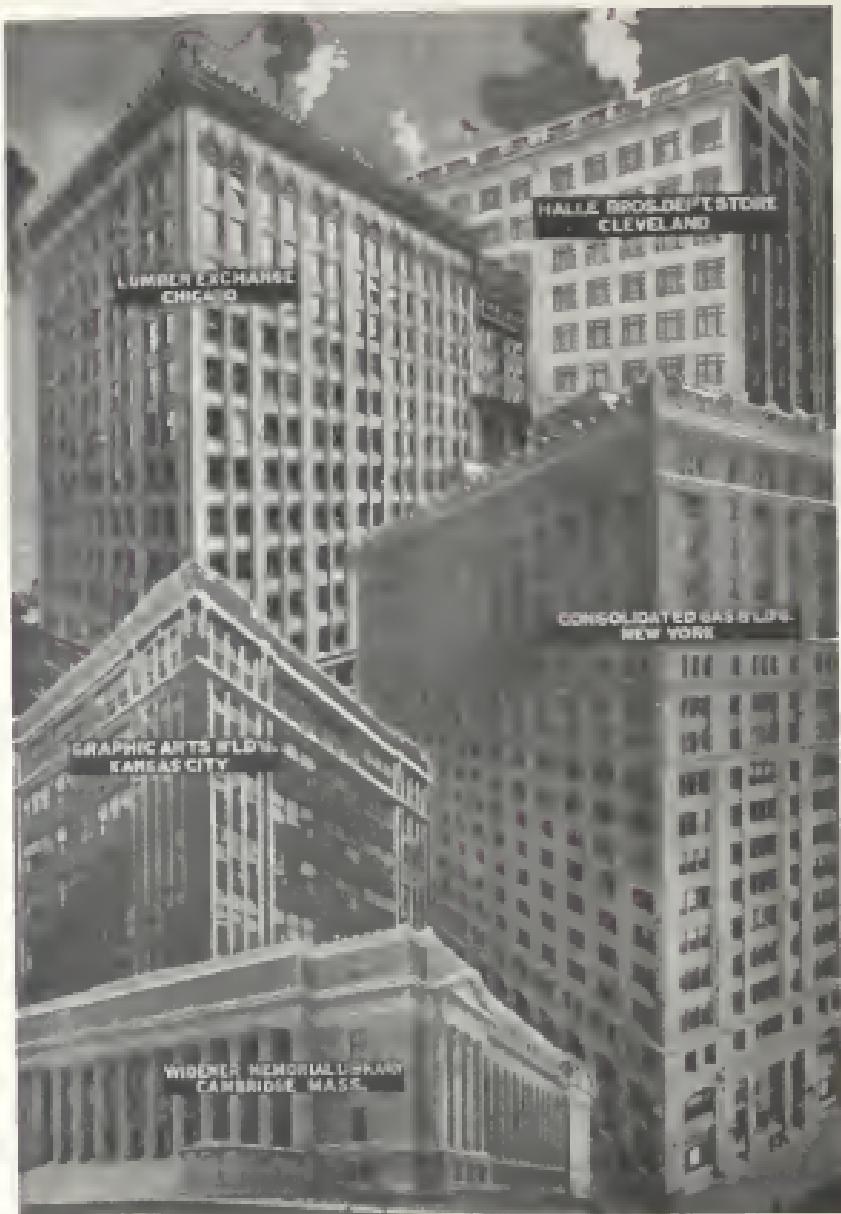
This explains why there is a difference of from 25 to 30% between the price of wrought iron and steel pipe.

In the puddling process, the iron is refined at a relatively low temperature, reducing the iron to a plastic state, whereby a certain amount of desirable slag is retained. In the steel process, the metal is reduced to a liquid state, causing all the slag to float to the top and be poured off.

Slag may be defined as a glassy substance consisting mainly of silicates, and well known as a non-corrodible, electrically almost inert material.

Wrought iron pipe contains about 6% of slag by volume, while steel contains none. Herein lies the main reason for the difference between the physical structure of wrought iron and steel, for the slag causes the iron when rolled, to become fibrous, while steel is crystalline. Herein also is to be found the fundamental reason for the greater resistance to corrosion possessed by genuine wrought iron, as will be shown in the following.

The slag does not combine with the iron in a chemical sense, but exists therein as a separate and distinct substance, evenly distributed; during the rolling process it becomes elongated into long fine fibers or bands.



Buildings Piped with Byers.

ARCHITECTS

Holabird & Roche, Chicago. Henry Bacon, New York.
S. B. Tarbett & Co., Kansas City. H. J. Hardenbergh, N. Y.
Horsse Trumbauer, Philadelphia.

The illustration on page 16 shows a cross section of iron pipe exposing the end sections of the slag bands. Bear in mind that only 1/40 part of an inch square is represented in this illustration, and it will be understood how finely the slag is distributed. A little calculation based on this illustration will demonstrate that there are over 250,000 streaks of slag to a square inch, which means a spacing so close as to defy imagination. It will also be noted that the bands present their greatest surface against corrosive attacks from the inside or outside of the pipe.

Among other physical differences can be mentioned that wrought iron has a better welding quality than steel, experiments having shown that Byers welds are practically as strong as the metal itself. Wrought iron pipe has therefore less tendency to open up in the weld. Further, the fibrous structure of wrought iron enables it most successfully to withstand for decades the shocks and vibration stresses inseparable from service in buildings of every description.

It is unnecessary here to comment on the finer points of difference as interpreted by a study of chemical analyses of the two metals.

Facts About Corrosion

The most advanced research work on corrosion problems done by the U. S. government and other disinterested authorities, more and more clearly indicates that the chemical composition of iron and steel is of minor consequence in accelerating or retarding corrosion. Thus, even the purest steel will, in the presence of water and oxygen, soon be attacked and corrosion progress rapidly through the metal, unless checked by some physical obstruction like the slag in wrought iron or the graphite flakes in pig iron.

As corrosion progresses in wrought iron pipe, the resistance to it will increase, for more and more inert slag becomes exposed to obstruct its attacks, and the length of the path through the thickness of the pipe is increased by the zig-zag nature of the obstructed course between the slag streaks.

Wrought iron will therefore rust more evenly all over, with only slight indications of pitting, while a pit, once started in steel pipe, will soon deepen and cause leakage, as there is nothing to stop its progress.

In the case of iron pipe containing steel scrap, corrosion will advance unchecked through the local areas in the pipe where the steel is present; further, the mixture itself is one which readily produces electrolytic action, due to the difference of electrical potential between the iron and steel.



Residence of Mr. Geo. W. Lutz, Wheeling, W. Va.
Architect, F. F. Faris. Byers Pipe installed throughout.



When you order Byers Pipe see that you actually get what you pay for. The Byers NAME and YEAR of Manufacture is rolled in every length of Byers Pipe, every few feet apart. The "Year on Every Length" demonstrates our own confidence in the durability of the Pipe.

It is therefore doubtful that the durability of wrought iron pipe containing steel scrap, is any greater than that of steel pipe of any kind.

Galvanized Pipe

Galvanized pipe has come into use extensively for plumbing purposes, and is well worth the extra price paid therefor. One fact must not be overlooked, however, namely, that the galvanizing is merely a protective coating which may, in a comparatively few years, become abraded or exposed in spots, exposing the metal to corrosion.

Ultimately the quality of the base metal will determine the life of the pipe, and it is therefore just as important to buy the best grade of galvanized pipe as it is to buy the best grade of black pipe. There is, in addition, considerable difference between galvanized coatings, some being heavy and some light, some made from pure spelter and others containing cheapening admixtures.

Genuine wrought iron has a comparatively rough



Some of the Pittsburgh Buildings equipped with Byers Pipe. This is significant, for nowhere are the merits of iron and

surface, absorbing spelter readily and giving it a tenacious hold on the metal, so that flaking or peeling off of the spelter is avoided.

Byers pipe has a galvanized coating about 40% heavier than that of ordinary galvanized pipe, and as this heavy coating adheres so firmly to the iron as to withstand the most severe tests, Byers galvanized pipe is even more superior to ordinary galvanized pipe, than Byers black pipe is superior to ordinary black pipe.

Back to Genuine Wrought Iron

In recent years a very noticeable reaction has set in in favor of genuine wrought iron pipe. This reaction naturally has not as yet to any degree influenced the sale of cheaper grades of pipe to the public at large who give the matter no thought. But it is very noticeable in skyscraper construction as well as in all other large buildings planned and constructed with expertness and care. Probably 85%



isive use of genuine wrought iron pipe in Pittsburgh—the steel city—
products weighed with a keener knowledge of true values.

of all the large buildings in the heart of Pittsburgh, the Steel City, are equipped with genuine wrought iron pipe. In New York City, according to the sales statistics of one of the most prominent pipe jobbers, the local sales for building operations a few years ago were about 40% of genuine wrought iron as against 60% of steel; these proportions have steadily changed in favor of wrought iron, so that about an equal quantity of each is now sold in that city for building purposes. Probably over 75% of all the pipe specified in New York City for large, permanent buildings, is genuine wrought iron. Steel pipe, nevertheless, will always be able to make a good showing quantitatively, simply because of the necessarily large proportion of people who merely ask for "pipe" and purchase it without a thought to anything beyond size and price. Tremendous tonnages of steel pipe are also used in the oil and gas fields, and in the manufacture of bedsteads, mattress frames, wheelbarrows, agricultural implements, etc., where durability is usually only a secondary consideration.

How to Specify Pipe

"Wrought Pipe" is a trade name for steel pipe, and even the words "iron pipe" are often understood to mean that either iron or soft steel pipe may be furnished. Manufacturers have constantly endeavored to improve the processes of manufacturing steel pipe, resulting in the marketing of same under new names in which the word "steel" is usually omitted. None of these steels contain any slag or any similar protective agents. Their advantage, therefore, over any other kind of steel, in respect to resistance to corrosion, is doubtful. Actual service records so far available have failed to show any superiority of these steels over ordinary well made Bessemer or Open Hearth steels.



Residence of Mrs. Fred Baker, Southampton, L. L.

Architects, Hiss & Weekes, New York.

Byers Pipe installed throughout.



Buildings Piped with Byers
ARCHITECTS

C. S. Frost.
E. W. & W. D. Hewitt.

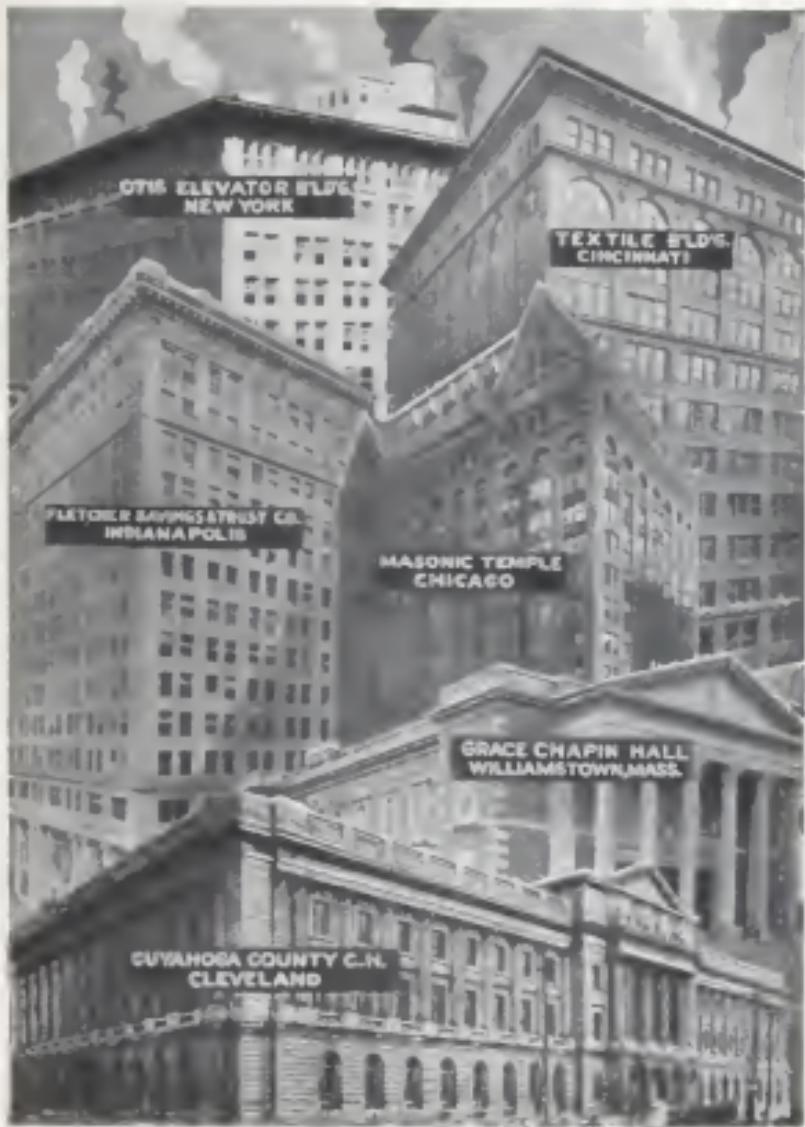
E. W. & W. D. Hewitt.
G. W. Drach, Cincinnati.
Esenwein & Johnson, Buffalo.

When wrought iron pipe is desired, the specifications often read "genuine wrought iron," but as this does not always exclude wrought iron containing steel scrap, it is safer to mention the name of a manufacturer known not to use scrap. In lieu of such a specification the following may be suggested:

"Genuine wrought iron pipe guaranteed to be free from scrap of any kind, (except manufacturing mill's own crop ends of pipe) and made exclusively from hand-puddled pig iron. Pipe to be full weight within a variation not exceeding 5% over and 2½% below card weight."



The black areas in above microphoto represent slag; the light areas are iron. The actual total area represented is smaller than a pin head, and the slag distribution therefore so fine as to defy imagination. The slag protects the underlying iron from corrosion.



Buildings Piped with Byers.

ARCHITECTS

Clinton & Russell, New York. G. W. Drach, Arch., and W. G. Vonnegut & Bohn, Indianapolis. Franz, Eng., Cincinnati.
Lehman & Schmitt, Cleveland. Hatzfield & Knox, Chicago.
Cram & Ferguson, Boston.

The only drawback to the latter specification is that it usually throws on the purchaser the burden of proof as to the existence or non-existence of scrap; the former specification mentioning manufacturer by name is therefore preferable where the purchaser is not prepared to make his own laboratory tests on the pipe furnished.

Those who wish to specify Byers pipe outright, can always be more sure of obtaining nothing but the highest grade of genuine wrought iron pipe, free from scrap, than those who use a specification of a more general character.

Hot and Cold Water Pipes

Records recently collected from nearly 150 old Pittsburgh buildings, brought out the fact that in none of these buildings had any trouble been experienced with cold water lines where Byers was installed, and all the pipe was in excellent condition after 15 to 30 years service.



Howard Apartments, Pleasant Valley, W. Va.
Architect, F. F. Faris, Wheeling, W. Va.
Byers Pipe installed throughout.



Buildings Piped with Byers.

ARCHITECTS

Smith, Hinchman & Grylls.
H. W. Cewan Eng.

Donaldson & Meier
Coolidge & Hodgdon
E. D. Litchfield.

As Pittsburgh water is as severe on pipe as is the tap water in any of our large cities, it is obvious that the use of brass pipe is seldom justified from any standpoint for cold water lines.

In hot water lines the average life of Byers galvanized pipe was found to be very close to that of brass; if Byers galvanized pipe, one size larger than that provided in ordinary practice, is installed, it would undoubtedly prove to be more satisfactory than brass. For more detailed information on this subject, see Byers Bulletin No. 30, which will be sent free on request.



Knickerbocker Club, New York City.
Delano & Aldrich, Architects.
Byers installed in heating and drainage lines.



St. Martin's Church, Brooklyn, N. Y.

John Bagley Day, Architect.

Byers installed in plumbing and drainage lines.

Comparative Cost of Pipe

Some people, knowing that Byers is a quality product, are under the impression that it is very high in price. Such is not the case, for the extra cost of Byers in any plumbing or heating installation seldom exceeds five per cent. on the entire job, and for piping the average residence the extra cost of Byers only amounts to five or ten dollars. Some contractors, indeed, make no extra charge for Byers Pipe, because they figure that the saving in time and labor effected by its use is sufficient to offset its slightly higher first cost.

Where price is a vital consideration, the use of Byers black pipe is recommended over that of galvanized steel.

It possesses superior corrosion resisting qualities, is more easily cut and threaded, makes tighter joints and, due to its fibrous structure, withstands vibration and severe shocks without danger of crystallization and fracture. Aside from these qualifications, it costs less than galvanized steel pipe, the difference being in some sizes as great as twenty-five per cent.

Records extending over a period of thirty years show that Byers extra heavy galvanized pipe is finding extensive use in severe service where brass pipe, costing five times as much as Byers wrought iron, was formerly employed.

Old Buildings

No more fitting evidence of the enduring qualities of Byers pipe can be pointed out than the hundreds of old buildings scattered throughout every city in the country, in which Byers has been in service from twenty to thirty or more years. A few typical examples are shown on the opposite page.

In 1889, Byers was installed in the Masonic Temple, Chicago. After twenty-seven years it is still apparently as good as when installed.

The Hostetter Building, Pittsburgh, erected in 1880, was equipped throughout with Byers. Practically no repairs have been necessary during the thirty-six years which have since elapsed.

Byers was installed in the Garfield Building and the Society for Savings Building, Cleveland, in 1890. A few slight changes have been made, but the greater part of the original piping is still in place after twenty-seven years of service.

When the Eden Musee, New York City, was torn down in 1916, the piping (Byers) was found to be in almost as good condition as when it was installed in 1883.

In the St. Louis Post Office and Customs House, over 50,000 feet of Byers pipe has been in use since the building was erected in 1881-82, and, as far as can be ascertained, no repairs due to deterioration have ever been necessary.

By contrast, a great many new buildings may be pointed to, not equipped with Byers, in which the piping has been, or is being replaced at a heavy expense after a few short years of service.



A few buildings in which Byers Pipe has been
in use over twenty-five years.



